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Differential characteristics related to later occupation of graduates from the Division of Agriculture at Iowa State College

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NOTE TO USERS

DIFFERENTIAL CHARACTERISTICS RELATED TO LATER OCCUPATION OF GRADUATES FROM THE DIVISION OF AGRICULTURE AT IOWA STATE COLLEGE

by

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I. INTRODUCTION

As the agricultural industry expands to provide greater quantities of food for the world's increasing population, the need for college-trained personnel in agriculture becomes paramount. To provide the best use of human resources, it is necessary to guide agricultural college graduates into occupations for which they are best suited.

Myths have indicated that certain characteristics are advantageous for particular jobs in agriculture as well as in other industries, but unfortunately research evidence is scarce regarding the attributes of men presently engaged in the various occupations. College administrators and counselors face the problem of guiding students in their choice of occupation with insufficient evidence regarding the qualities needed to satisfactorily fulfill the duties of a particular vocation.

It is not always possible to consider fully the interests, aptitudes, and abilities of students at the time of their placement. The availability of jobs and economic factors vary from year to year. It should be useful, however, to set up standards by which counselors may compare the characteristics of an individual to those of

college graduates already established in agricultural occupations.

Vocational success is an elusive term which may have many meanings. If research is to be accomplished concerning the propitiousness of agricultural college graduates in their occupational pursuits, it becomes desirous to adjudge the various facets of vocational success.

If employees of a particular plant were being studied, employer ratings undoubtedly would provide a reasonably accurate measure of the competence of individual workers, and would be indicative of success on the job. Success also may be considered as advancement to executive position, or in the case of college teachers and research personnel, may be evaluated by the number of publications, advancement in rank, or other evidence of academic accomplishment. Inclusion in such publications as Who's Who in America is sometimes considered a criterion of recognition for outstanding achievement.

Amount of earned income is a more concrete measure of vocational success than the foregoing, and one which may be readily obtainable. Although that criterion overlooks such aspects of success as personal satisfaction or service to society, it is sometimes assumed to be a reasonable indicium of vocational competence.

Although earned income is used as a criterion of success in this study, its use does not in any way indicate that income is the most important measure of success. Rather its use is based on the availability of earned income information and the inaccessibility of other criteria of success.

The Iowa State College Division of Agriculture offers training in 13 different curricula designed to prepare individuals for positions in various spheres of the agricultural industry. Certain occupational areas, however, provide employment for men with a broad background in technical agriculture which may be provided in any of several curricula.

Graduates who in 1952 were employed in the fields of extension, college teaching and research, journalism, sales, and farming were considered in this study. Available information believed to have a possible relationship to later occupation was selected for statistical analysis. Magnitude of earned income was chosen as the criterion of success. The primary purpose of this research was to ascertain characteristics associated with occupational choice and advancement for college graduates in agriculture.

II. REVIEW OF LITERATURE

Only a few studies have been made dealing with factors related to occupational choice of college graduates. Several have been made, however, concerning characteristics affecting vocational success.

Bell[1] conducted a study to discover differences in characteristics among men qualified to teach vocational agriculture who had entered and remained in that teaching field, and those qualified who had not entered teaching or who had not remained in that occupation. The chief bases of comparison were (1) general background experience of the qualifiers, and (2) attitudes toward certain phases of teaching. Information obtained included occupational pursuits since the men had qualified to teach, their background experiences, the activities engaged in while in college, reaction to programs associated with teaching vocational agriculture, some reasons for their not having entered teaching, and some reasons for their discontinuance of teaching as an occupation.

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[1]Bell, Everette L. Factors Influencing Occupational Choice of Men Qualified to Teach Vocational Agriculture. Unpublished M. S. Thesis. Ames, Iowa, Iowa State College Library. 1950.

The extent of farm background experience apparently was not associated with the choice of graduates to enter or not to enter teaching. According to Bell those who had more than two years of non-farm work experience prior to their qualifying to teach tended to be more likely to enter teaching and remain in it than did those who had a lesser amount of non-farm work experience. There was an indication that neither the number of years of enrollment in vocational agriculture nor the extent of 4H training is associated with the qualifier's choice to enter teaching.

The study revealed a significant tendency for men who were married at the time they qualified, to enter teaching to a greater extent than was true of single men. Significant differences were observed between the groups in the extent of participation in extracurricular activities, including non-varsity sports. The group which had not entered teaching reported that they had had a greater extent of leadership experience than had the remaining qualifiers. The chief reasons given for not having entered vocational agriculture teaching were (1) lack of security of tenure, (2) higher salary elsewhere, and (3) desire to utilize the training for purposes other than teaching.

The reason most often checked for a qualifier's having moved from one vocational agriculture teaching job to

another was "higher salary". The desire for broader personal and professional experience and self-improvement were main reasons given by those individuals who had discontinued the teaching of vocational agriculture.

An attempt was made by Reinebach[1] to predict permanency in teaching for college students qualifying to teach vocational agriculture. The study was inspired by the knowledge that some students who qualify in this field find themselves without either the personal traits or the interest needed for permanency in teaching. Information gathered concerning college students qualifying to teach vocational agriculture included their farm experience, college extracurricular activities, scholastic aptitude, and academic achievement. None of the variables yielded significant biserial correlation with the number of years spent in teaching agriculture. The attempt to predict satisfactorily permanency in teaching for college students qualifying to teach vocational agriculture was unsuccessful.

Leibler[2] reported a survey by Provident Mutual Life Insurance Company of Philadelphia which was conducted to

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[1]Reinebach, Loyal M. Prediction of Permanency in Teaching for College Students Qualifying to Teach Vocational Agriculture. Unpublished M.S. Thesis. Ames, Iowa, Iowa State College Library. 1951.

[2]Leibler, Leslie. It Pays to Be Tall. Des Moines Sunday Register, This Week, 12-13. June 28, 1953.

determine the relationship between height and success. The criterion of success used was size of insurance policy held, in the belief that the size of policy is a key to earning power. Although the magnitude of the correlation was not reported, a direct relationship between height and success was indicated. Leibler also stated that the American populace is gaining in physical stature. He reported that the average soldier in the United States Army today is nearly four inches taller than his counterpart in the Revolutionary War.

Simon and Levitt[1] administered individual Wechsler-Bellevue intelligence tests to a sample of 1753 gainfully employed adults. Purpose of the study was to gain information regarding intelligence levels of various occupational groups. No negros were included in the study, and no sex differentiation was made. Tables were presented showing scores on the Wechsler-Bellevue Intelligence Scale in relation to numerous occupations. Scores were reported in descending order for persons in the occupational areas of engineering, medicine, education, social work, arts, sales,

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[1]Simon, Loron M. and Levitt, Eugene A. The Relation Between Wechsler-Bellevue I. Q. Scores and Occupational Area. Occupations. 29:23-25. October, 1950.

office work, and labor. A complete breakdown of scores in 16 major occupational classifications was reported.

A study was made by Jepsen[1] to discover how beneficial extracurricular activities are to later vocational life. It was believed that such a study would help determine the emphasis which should be devoted to extra-class activities, and would aid in vocational guidance and placement.

Extra-class records of 488 male graduates of Fresno State College, California, during the years 1929-1933 were evaluated, and compared with the 1947 annual earnings of the graduates. The students were rated on the basis of their college activities as found in the college yearbook. A correlation of 0.27 was found between extracurricular activities and annual earnings. A 0.0 correlation was found between college grades and income in later occupation. Correlation values reported for occupational groups are shown in Table 1.

An interesting aspect of this study was a disproportionately large number of low earnings received by graduates with no extracurricular activities, and the consistently high incomes earned by those who ranked highest in extra-

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[1]Jepsen, Victor L. College Activities and Vocational Success. Occupations. 29:345-347. February, 1951.

Table 1

Correlation between Extra-curricular Activities and Incomes of Male Fresno State College Graduates by Occupational Groups 1929-1938

	Number	r
Professional	27	0.06
Administrators	39	0.28
Business	110	0.23
Teachers	117	0.32
	293	0.27

curricular activities. Jepsen concluded that, while extra-curricular activity does not appear to forecast future vocational success, it apparently bears a closer relationship to financial success than does high scholastic ranking.

Lattin[1] studied factors associated with success in hotel administration for college graduates employed in that field. A representative sample of 595 former students in the Hotel Administration curriculum at Cornell University was selected. Each man had been in the field at least 14 years, and on the basis of his record was rated successful

[1]Lattin, Gerald W. Factors Associated with Success in Hotel Administration. Occupations. 29:36-39. October, 1950.

or unsuccessful. The top 15 percent of successful men and all the unsuccessful men were chosen as the two groups for intensive study. The search for factors associated with success covered the three areas of personal characteristics, interests, and values. Included as personal characteristics were information regarding cumulative college average, age at entrance, number of extracurricular activities, number of subjects failed in high school, number of siblings, parental employment, parental education, average grade in required accounting and engineering subjects, and membership in college honorary societies.

The Kuder Preference Record was the instrument used to measure interests. The study of values was done using Egbert's Study of Choices. The successful and unsuccessful groups were statistically compared on each item of personal characteristics, interests, and values to determine which areas significantly differentiated one group from the other.

The criterion for success used was progress toward executive position in the hotel industry. There was a statistically significant tendency for those who had been better than average academically while in college to be successful hotel administrators. Seventy-five percent of the unsuccessful men earned grades below the average, but only 44 percent of the successful did below average college

work. Factors not related to vocational success were found to be age at entrance, number of extracurricular activities, number of subjects failed in high school, number of siblings, and parental education. Students with parents in the hotel industry proved unsuccessful as often as did students whose parents were in other occupations. Although a knowledge of accounting and hotel engineering is considered basic to successful operation of a hotel, grades in these courses had no significant relationship to the criterion of success used. Some relationship was found between the computational, pursuasive, and musical areas of the Kuder Preference Record and success in hotel administration.

Seventy-five percent of the unsuccessful group had no membership in honorary societies, while only 20 percent of the successful group failed to attain membership in at least one honorary society. In the study of values, the unsuccessful group placed a higher value on personal comfort and on intellectual activity as measured by the Egbert Study of Choices than did the successful group. The successful men showed a strong preference for the values of society life and recognition.

This study of factors associated with success in hotel administration was the most comprehensive study of characteristics associated with success in later occupation of those here reviewed.

Super[1] discussed the criteria of vocational success, and pointed out some of the changes which have occurred in selection of criteria for research in this area. He stated that individual values, and hence individual judgments, differ in the matter of success. The use of rating scales which assess the worker's satisfaction in his job and his relationship to fellow employees is suggested in this article. Other criteria discussed included productivity of the employee, as well as his application and industriousness, and his ability to provide a living for his family.

A recent study by Rhea[2] is closely associated with the present research. Evaluation of the responses of graduates of the Iowa State College Division of Agriculture to a comprehensive questionnaire was made, and the present status and opinions of those graduates of the 21 year period, 1932-1952, inclusive, were studied. From 4439 graduates who were sent questionnaires, 3593 or 85.6 percent usable returns were received. Certain of the data used in the present

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[1]Super, Donald E. The Criteria of Vocational Success. Occupations. 30:5-9. October, 1951.

[2]Rhea, Mark B. Present Status and Opinions of Graduates Granted Bachelor of Science Degrees Since 1932 in Agriculture Curricula at Iowa State College. Unpublished Ph.D. Thesis. Ames, Iowa, Iowa State College Library. 1953.

investigation were obtained from questionnaires completed by graduates for the survey made by Rhea.

At the time of that study, 470 graduates listed their present occupation as education. Graduates engaged in extension service numbered 175. There were 702 graduates, or approximately 20 percent engaged in farming. Commercial enterprises other than farming provided employment for 1,296 graduates of whom 968 were in commercial agricultural enterprises, 123 in commercial non-agricultural enterprises, and 205 in small business ventures. An additional 470 graduates were in government service, which accounts for all except 480 of the respondents. These 480 were placed in a group designated as others, which included 267 who were in military service at the time the survey was made.

The shifts from first to later occupations were noted by Rhea. There were 483 individuals who returned to the farm directly upon graduation, whereas 702 graduates were farming in 1952 when the survey was made. Migration from the occupational areas of education, extension, and government service was particularly noticeable.

The earned income of the graduates was obtained and used as a means of evaluating the effectiveness of a college degree in the various curricula of the Division of Agriculture at Iowa State College. A mean income of 5,269 dollars

and a median of 4,586 dollars were obtained for all graduates. When the mean income was plotted by number of years since graduation, an upward trend in earned income was evident depending upon the number of years since graduation.

Among thirteen more or less distinct occupational groups studied, mean beginning incomes varied from 3,297 dollars for graduates engaged in research to 4,750 dollars for those engaged in small business enterprises. Predictions made for 20 years after graduation indicated that the highest income (9,588 dollars) could be expected in industrial management, and the lowest (4,781 dollars) in teaching vocational agriculture.

It was concluded by Rhea that responses to the questionnaire revealed that graduates in agriculture at Iowa State College during the 21 year period, 1932 to 1952, inclusive, had received an education which had prepared them for leadership in the agricultural industry.

A comprehensive survey of college graduates in the United States was reported by Havemann and West[1]. This survey, conducted by Time Magazine and analyzed by the Columbia University Bureau of Applied Social Research, described in

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[1]Havemann, Ernest and West, Patricia Salter. They Went to College. New York, Harcourt, Brace and Company. 1952.

detail numerous characteristics and opinions of 9,064 graduates of U. S. institutions of higher education. Some of the areas considered which are pertinent to the present investigation were the affect of college grades and extracurricular activities upon income from later occupations. Financial rewards from various occupations were compared. Graduates in the fields of medicine and law were found to be making the most money, while clergymen and graduates employed in the education field were the poorest paid of the broad occupational classifications.

Grades earned in college appeared to be influential in the type of career chosen by graduates. Of the graduates who made mostly A's, 48 percent were in the professions, 44 percent in business, and eight percent in government service. Of those who made mostly C's and D's in their college work, 29 percent were in the professions, 61 percent in business, and 10 percent in government service.

When median earnings were considered, those graduates who made the best grades while in college were also getting the best financial returns from their education. Little relationship was noted, however, between participation in extracurricular activities while in college and income in later life.

It may be noted that although several studies have been done dealing with attributes related to success in later occupation, very little has been accomplished in the area of determining characteristics that can be used to compare students who are graduating from college with earlier graduates already engaged in occupational pursuits. Statistical analysis of characteristics related to occupational success was limited, in most cases, to correlation. It would seem that further study in this area should be of value to college officials charged with the responsibility of placing graduates in positions where their unique aptitudes and abilities may best be utilized.

III. METHOD OF PROCEDURE

Data for this research were obtained from three sources. Names of Iowa State College graduates during the period 1932 to 1952, inclusive, who were in the occupations (1) journalism, (2) sales, (3) farming, (4) college teaching and research, and (5) extension were obtained from the questionnaire responses to the survey by Rhea[1]. Further data from that survey which were useful for this study included residence of graduates prior to college entrance, extent of participation in extra-curricular activities while in college, and 1952 earned income of the graduates.

Information was obtained concerning 119 graduates who were engaged in college teaching and research in 1952, 109 in journalism, 380 in farming, 158 in sales, and 134 in extension. In order to equate the size of the occupational groups for statistical analysis, each category was sampled down to 100 by use of a table of random numbers.

The source of information regarding scholastic ability and scholastic achievement was the office of the Registrar

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[1]Rhea, Mark B. Present Status and Opinions of Graduates Granted Bachelor of Science Degrees Since 1932 in Agriculture Curricula at Iowa State College. Unpublished Ph.D. Thesis. Ames Iowa, Iowa State College Library. 1953.

at Iowa State College. Records of the personnel office of the Division of Agriculture at Iowa State College revealed the height of the graduates here studied.

Characteristics available from the aforementioned sources which were believed to have a possible relationship to either earned income or choice of occupation were (1) college grade average, (2) agriculture grade differential, (3) science grade differential, (4) social science grade differential, (5) communications grade differential, (6) high school average, (7) scholastic aptitude percentile rank, (8) extracurricular activities, (9) height, and (10) residence prior to college entrance.

To obtain the differential grades in the subject matter areas of agriculture, science, social science, and communications, the first three grades received at Iowa State College in each of those areas were secured from the office of the Registrar. The difference between the average in a particular area compared with the cumulative average of the other three areas was designated as the grade differential for that area. To facilitate statistical treatment by elimination of decimals and negative values, each grade differential was multiplied by nine and increased by twenty-five.

Grades used to determine the differential grade in the subject matter area of agriculture consisted of grades in the first three courses taken at Iowa State College in animal husbandry, farm crops, soils, etc. The first three courses taken at Iowa State College in the areas of English, speech, and journalism provided grades used to obtain the communications differential. Course grades used in the determination of the science differential included grades in the first three courses taken at Iowa State College in either physical or biological science. The characteristic of social science differential was determined using the first three grades earned at Iowa State College in the areas of economics, sociology, government, and history.

The scholastic aptitude percentile rank was the rank of the individual on the scholastic aptitude test given at the time of college entrance. The measure used for participation in extracurricular activities was the response of the graduates to an item on the Rhea questionnaire, where they were asked to indicate the extent of their participation as "above average", "average", or "below average". Numerical values of one, two, and three, respectively, were assigned to the responses.

Annual earned income of the graduates, which was used as the criterion of success in this study, was the 1952

earned income from major job, exclusive of supplemental income from other sources. Since earned income is thought to be a function of the number of years since college graduation, median income data were fitted to a quadratic curve to give an adjusted median income for each year following graduation. The median earned income adjusted for number of years since graduation was used to separate graduates in each occupation into equal groups of higher and lower income.

This study was designed not only to determine attributes associated with success as measured by earned income, but also to evaluate characteristics associated with the tendency to enter particular vocations. Discriminant analysis was used to assign weights to the characteristics for the purpose of comparing the attributes of an individual with those of Iowa State College graduates employed in the five occupations considered.

Other statistical techniques used were biserial correlation, analysis of variance, and the t-test.

IV. INCOME ADJUSTMENTS FOR EXPERIENCE

One of the purposes of this investigation is to determine the relationship of certain scholastic and personal characteristics to the success of agricultural graduates in their chosen fields of endeavor. Probably one of the more objective measures of the success of an individual is the salary or earned income from his major job. Earned income, as used in this investigation, is the 1952 income from major job as reported by the graduates who responded to the Rhea questionnaire.

It is well known that the average income of college graduates in many occupations is a function of the number of years since graduation. For this reason, it became necessary to adjust earned income for the number of years since graduation to obtain a usable criterion of success.

Rhea[1], in his treatment of income and number of years since graduation, noted that when mean incomes were plotted by year of graduation an upward trend in income was evident

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[1]Rhea, Mark B. Present Status and Opinions of Graduates Granted Bachelor of Science Degrees Since 1932 in Agriculture Curricula at Iowa State College. Unpublished Ph.D. Thesis. Ames, Iowa, Iowa State College Library. 1953.

as graduates were out of college a greater length of time. From inspection of the average income of all graduates during the 21 year period, a straight line trend was suggested; i.e., a constant increase in income occurred annually regardless of the number of years since graduation. Using the equation of a straight line, $Y = aX + C$, where Y is the predicted mean income and X the number of years since graduation, Rhea solved for predicted mean incomes for from one to twenty-one years since graduation[1]. Upon comparison of the predicted means with the actual means within the 21 year period, he suggested that for the 21 year period a linear relationship is a reasonable assumption. He noted, however, that use of the linear equation for interpolation within the 21 year period tended to overestimate for recent and early graduates and underestimate for those who graduated during the middle years of the study. For that reason, a straight line equation was considered unsuitable for the purpose of adjusting income for number of years since graduation in that study.

It was also deemed likely by Rhea that the greater demand for younger men for salaried positions suggested an annual mean salary increment greater than the 202.59 dollars

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[1]Ibid., p. 81.

obtained with the straight line equation during the years immediately following graduation, with gradual diminution during the ensuing years until finally the annual increment would become zero, followed by negative values. Such consideration lends credence to the possible advantage of a quadratic over a linear equation for the purpose of adjusting income for number of years since graduation to obtain a criterion of occupational success.

A quadratic equation as indicated by $Y = aX^2 + a_2X + C$ was found by Rhea by the method of least squares from the weighted mean earned income and number of years since graduation.[1] The resulting equation was:

$$Y = -4.8353X^2 + 298.2733X + 3300.55 .$$

When this equation was solved for number of years since graduation, the annual increments were unequal, varying from 284 dollars between the first and second years to 100 dollars between the twentieth and twenty-first years. A test of the significance of advantage of quadratic over linear regression yielded a t-value of 6.18 which is significant far beyond the one percent level. Another advantage of the quadratic over linear regression is the more realistic

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[1]Ibid., p. 81.

estimate for purposes of extrapolation beyond the 21 year period.

The need for salary adjustments in the present study resulted from the decision to use earned income as a criterion of success for graduates in the five occupational groups studied. Weighted mean income for each occupational group was first used in the attempt to fit a curve which was not only satisfactory from the standpoint of the data obtained, but also from logical consideration. Observation of the data indicated that weighted median income might provide a more satisfactory prediction than the weighted mean, in that undue effect from extremely high or low salaries would be avoided.

When the quadratic equations using weighted median incomes were solved for the five occupational groups, one important logical consideration was still violated. Knowledge of normal income trends of college graduates suggests average annual increases for most of the employment life of an individual, but expects a diminution of such increases in the later years followed by probable reductions in income during the years immediately prior to retirement. Such was not the case in some of the occupational groups studied, probably because of paucity of the data available. Graduates studied included only those who had received B.S.

degrees from Iowa State College during the past 21 years. In certain occupations such as college teaching and sales, no leveling off of income could be noted by extrapolation during the normal employment life.

Hence it was deemed necessary, on the basis of observed characteristics of income trends, to use an adjustment formula which would produce (1) greater salary increments during early years of employment, (2) lesser increments during later years of employment, and (3) a maximum income at some point prior to retirement age. Application of such a formula, it was believed, should provide a reasonably accurate income curve for use in dividing the graduates in each occupational group into "above average" and "below average" groups with regard to earned income.

In the Rhea study with 3,115 reported salaries for graduates in a wide variety of occupations, the quadratic equation yielded a maximum salary at approximately 30 years after graduation[1]. It seemed better, for purposes of this study, to use an equation which would yield a maximum at 30 years instead of determining the maximum in each of the five occupational groups consisting of relatively few graduates compared with the total group studied by Rhea.

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[1]Ibid., p. 82.

Thus an equation was desired of the form $Y = -aX^2 + 60aX + C$. By the method of least squares, the normal equations are:

$$60\Sigma XY - \Sigma X^2Y = a\left[\Sigma X^4 - 120\Sigma X^3 + 3600\Sigma X^2\right] + C\left[60\Sigma X - \Sigma X^2\right]$$

$$\Sigma Y = a\left[60\Sigma X - \Sigma X^2\right] + NC \ .$$

Substitution of the income and years since graduation values for graduates engaged in college teaching and research yielded:

$$3{,}063{,}303 = 31{,}765{,}963a + 56{,}501C$$

$$6{,}143 = 56{,}501a + 119C \ .$$

Simultaneous solution of the two equations yielded an adjustment equation of:

$$Y = -\ .029629864\,7X^2 + 1.77779188X + 37.553678 \ .$$

Solved for the first and twentieth years after graduation, the equation yielded adjusted annual income values of 3,930 dollars for the first year and 6,126 dollars for the twentieth year, for those graduates engaged in college teaching and research. Table 2 shows predicted incomes for one to twenty-one years for graduates employed in the five occupational groups.

Table 2

Predicted Median Incomes Adjusted for Year of Graduation for Various Occupations (in dollars)

Years since graduation	College teaching	Sales	Extension	Journalism	Farming
1	3930	3703	3952	3694	3662
2	4099	3986	4062	4079	3842
3	4262	4258	4168	4451	4017
4	4419	4521	4270	4809	4184
5	4570	4773	4369	5153	4346
6	4715	5016	4464	5484	4501
7	4855	5249	4554	5801	4645
8	4988	5472	4641	6105	4793
9	5115	5685	4725	6396	4929
10	5237	5888	4804	6673	5059
11	5352	6081	4879	6936	5182
12	5460	6264	4951	7186	5299
13	5566	6437	5018	7422	5410
14	5664	6601	5082	7645	5515
15	5755	6725	5142	7855	5613
16	5841	6898	5198	8051	5705
17	5921	7032	5250	8233	5790
18	5995	7156	5299	8402	5869
19	6064	7269	5343	8557	5942
20	6126	7374	5384	8699	6009
21	6182	7468	5420	8827	6069
30	6422	7869	5577	9374	6326

For graduates employed in the field of journalism, substitution of income and year of graduation values into the normal equations yielded:

$$2{,}291{,}551 = 27{,}596{,}884a + 46{,}352C$$

$$6{,}723 = 43{,}352a + 109C \ .$$

Simultaneous solution of the equation yielded an adjustment equation of:

$$Y = -.0675404541X^2 + 4.052427246X + 32.9574760 \ .$$

Upon solution, this equation produced adjusted annual income values of 3,684 dollars for the first year and 8,699 dollars for the twentieth year as shown in Table 2.

When substitution of income and year of graduation values into the normal equation was made for graduates engaged in farming, the equations became:

$$9{,}602{,}710 = 105{,}596{,}378a_1 + 180{,}091C$$

$$18{,}909 = 180{,}091a_1 + 380C \ .$$

Simultaneous solution of the equations yielded an adjustment equation of:

$$Y = -.03167320793X^2 + 1.900392474X + 34.7498429 \ .$$

Solution of this adjustment equation produced annual income values of 3,662 dollars for the first year following graduation, and 6,009 dollars for the twentieth year after graduation. Predicted income values for farmers for all years included in the study are shown in Table 2.

For graduates employed in the sales field, substitution of income and year of graduation values into the normal equations produced:

$$3{,}753{,}704 = 32{,}761{,}153 + 62{,}471C$$

$$8{,}484 = 62{,}471a + 158C \ .$$

Solved simultaneously, these equations produced the adjustment equation:

$$Y = -.0495284774X^2 + .9717086\overline{44}X + 34.113322C \ .$$

Adjusted annual income values produced by this equation for graduates in sales were 3,703 dollars for the first year and 6,126 dollars for the twentieth year. Values for all years included in the study are shown in Table 2.

Similar substitution of values for graduates in extension was made into the normal equations, yielding:

$$2{,}657{,}773 = 29{,}878{,}482a + 54{,}210C$$

$$6{,}190 = 5{,}421oa_1 + 134C \ .$$

Simultaneous solution of these equations yielded an adjustment equation of extension:

$$Y = -.01932595919X^2 + 1.159539551X + 38.37579111C .$$

Upon solution, the adjustment equations yielded predicted income values for graduates in extension of 3,952 dollars for the first year following graduation and 5,384 dollars for the twentieth year.

Although it was not an express purpose of this study to compare income trends of graduates in different occupations, it may be interesting to note the disparity in trends evidenced by the fitting of quadratic curves to the income data available. Earned income during the first year following graduation from college was highest for those engaged in extension work, with lower incomes in college teaching and research, sales, journalism, and farming, in that order as shown in Table 2. Ten years following graduation, those working in the journalism field had moved from fourth place up to first on the salary scale, while those in extension had moved from first place to last. At the maximum expected salary 30 years after graduation, journalists were ahead with predicted salaries of 9,374 dollars as compared with 7,869 dollars for graduates in sales, 6,422 dollars for college teaching and research, 6,326 dollars for farmers,

and 5,577 dollars for those in extension. Annual increments in all groups were greatest during early years and least during the later years.

Comparison with predicted incomes in the Rhea[1] study is of little value, since weighted median incomes rather than weighted means were used in the present investigation. It is believed that, for purposes of this study, where earned income is used as a criterion for occupational success, the weighted median as here used provides a reasonably accurate basis for division of graduates within the five occupational groups into "above average" and "below average" categories of occupational success.

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[1]Ibid., p. 89.

V. CHARACTERISTICS RELATED TO EARNED INCOME

Success is an intangible quality which is not only difficult to evaluate, but likewise is difficult to define. It is possible for a man to achieve success without ever attaining a high income, if success is considered on a basis of service rendered to society. Such service might well be considered a criterion of success. Appraisal of the numerous individuals included in this study on that basis, however, would be a virtual impossibility.

Another possible means for ascertaining the degree of success for individuals is by obtaining ratings by competent persons familiar with the performance of those to be studied. Such a measure would be extremely difficult to obtain for graduates who had been out of college for several years, and would be highly subjective even if it were obtainable.

Earned income is an objective measure of the competence of an individual in his vocation, and is the criterion of success used in this study. Use of earned income as the criterion of success is based largely on availability of earned income information.

The earned income of each of the graduates was obtained from the Rhea questionnaire, and comprised only income from major job. Supplemental income from other sources was not considered earned income for purposes of this study.

In the analysis of characteristics related to earned income, graduates of the Iowa State College Division of Agriculture in the five occupations, (1) college teaching and research, (2) farming, (3) extension, (4) journalism, and (5) sales, were considered. The graduates included in the occupational category of college teaching and research were those who reported in response to the Rhea questionnaire that their present position was in either of those areas. Inclusion of graduates engaged in those two areas of college work in a single category was necessary to secure sufficient cases for the study. The farming category included those who reported farming as present position in the Rhea questionnaire, and did not include farm managers or others not actively engaged in farming.

Graduates in the extension group were largely in extension work at the county level, although a few were included who were employed in extension at the state level. The sales group was made up of graduates who listed their present position as sales, and included those engaged in selling

feed, seed, fertilizer, machinery, insurance, etc. Graduates included in the occupational category of journalism were those employed in the various media of communications. Graduates considered in the journalism field included those who were radio and television editors, public relations personnel, magazine and newspaper editors, etc. None of the occupational groups was selected on the basis of college curriculum, and graduates from several different curricula were found in each category.

The total number of graduates in each occupational group for whom complete data were available ranged from 109 in journalism to 380 in farming. To avoid complications in analysis due to disproportionality of graduates in the five occupations, the groups were reduced by use of a table of random numbers to a total of 100 graduates each.

Choice of characteristics used in this study was made with the idea that some of them might serve to differentiate between the more successful and less successful graduates in the five occupations when earned income was used as a measure of success. Educational and personal characteristics believed to be useful for this purpose were obtained from the office of the Registrar, the Rhea questionnaire, and from the personnel office of the Iowa State College Division of Agriculture. Measures of scholastic aptitude

and scholastic achievement used were (1) college grade average, (2) high school grade average, and (3) percentile rank on scholastic aptitude tests taken at the time of college entrance.

In an attempt to obtain factors which might differentiate between the more successful and less successful graduates as far as earned income was concerned, grades in various subject matter areas were obtained. The first three grades earned in (1) agriculture, (2) science, (3) social science, and (4) communications were averaged for each of the areas. The mean grade difference between each area and the mean of the composite of the other three areas were obtained. This variation of each area from the other areas was designated as differential achievement and used as a characteristic in the study of earned income. To eliminate fractions and negative values, this differential grade was multiplied by nine and then increased by 25 to facilitate further statistical treatment.

Participation in extracurricular activities while in college has been thought by many to be indicative of future leadership and future success. An item in the Rhea questionnaire in which graduates were asked to respond to the number of extracurricular activities engaged in as "above average", "average", or "below average" was used as the

measure of extracurricular participation for the present study. Numerical values of one, two, and three were assigned to the responses "above average", "average", and "below average", respectively.

The height of the graduates, as reported in college personnel records, also was obtained in the quest for characteristics which might affect the earning power of college graduates in agriculture.

Use of the quadratic equation to adjust the median annual earned incomes permitted the categorization of each graduate as "above average", or "below average" in his occupation. On this basis each of the occupational groups was subdivided into high and low earned income categories. Analyses of the high and low earned income groups were made to determine the relationship of the various characteristics to earned income.

A. Relationship of Characteristics to High-Low Earned Income

Analysis of each of the characteristics was made using biserial correlation as a measure of the relationship of the characteristics to the dichotomized earned income criterion.

Further evaluation of the difference between high and low earned income groups was made using the t-test as a measure of significance.

1. Grade average

The all-college grade average as recorded in the registrar's office is the average of all courses taken by an individual at Iowa State College, with numerical values of four, three, two, one, and zero assigned to the letter grades A, B, C, D, and F, respectively. Thus, an all-college grade average of 2.5 would be midpoint between a C and a B average.

The t-test was used to determine significance of the difference between the mean grade average of high and low earned income groups in each of the occupational categories. Biserial correlation was used to determine the relationship of grade average to earned income in the various occupations studied. Values of t and r_{bis} are shown in Table 3. The biserial correlation values reported in Table 3 as well as elsewhere throughout this study were obtained by first computing the point biserial correlation, followed by correction for the dichotomous variable.

It may be noted that, although the biserial correlations were small between college grade average and tendency to be

Table 3

College Grade Average

Occupation	r_{bis}	t
Extension	0.1113	0.8848
Farming	-0.0646	0.5112
Journalism	0.1592	1.2710
Sales	-0.0502	0.3973
College teaching	0.2433	1.9740[1]

[1]Significant at 5 percent level.

in the high or low earned income group for all occupations, the greatest relationship was for graduates engaged in college teaching and research.

The t-test revealed a significant difference at the 5 percent level for college grade average for those engaged in college teaching and research. All other t-values were non-significant.

2. Agriculture grade differential

Agriculture grade differential was the designation given the difference between the mean of the first three grades earned in agriculture and the mean of the first three grades earned in each of the areas, science, social science, and communications. To obtain more convenient values for

Table 4

Agriculture Differential

Occupation	r_{bis}	t
Extension	-0.0221	0.1749
Farming	0.1350	1.0750
Journalism	-0.1337	1.0640
Sales	-0.0070	0.0553
College teaching	0.0100	0.0789

analysis, this mean differential was multiplied by nine and increased by 25. Values of t and r_{bis} for the agriculture differential and earned income in the various occupations are shown in Table 4.

As revealed in Table 4, little relationship could be shown between high and low earned income groups with regard to agriculture grade differential. The t-test revealed no significant difference between high and low earned income groups for any occupation.

3. Science grade differential

The science grade differential was obtained in a manner similar to that used to determine the agriculture grade differential. The t-test and biserial correlation analyses yielded values as shown in Table 5.

Table 5

Science Grade Differential

Occupation	r_{bis}	t
Extension	0.0924	0.7329
Farming	-0.0941	0.7464
Journalism	0.1170	0.9296
Sales	0.0788	0.6243
College teaching	0.0701	0.5554

No significant difference in science grade differential could be shown between high and low earned income groups for any of the five occupations. Small positive correlations were indicated between the science differential grade and earned income in all occupations except farming, which showed a negative correlation of 0.0941 as shown in Table 5.

4. Social science grade differential

A social science grade differential was obtained by determining the difference between the grade average for the first three social science courses taken at Iowa State College and the average of the first three courses taken in each of the areas of agriculture, science and communications. Analyses using biserial correlation and t-test yielded values as shown in Table 6.

Table 6

Social Science Grade Differential

Occupation	r_{bis}	t
Extension	0.1846	1.4805
Farming	-0.0781	0.6188
Journalism	0.1682	1.3450
Sales	-0.0589	1.4730
College teaching	0.1692	1.3530

Small positive correlations were obtained between social science grade differential and earned income for Iowa State College graduates employed in the areas of extension, journalism, and college teaching and research. No significant differences in the magnitude of the social science grade differential were found for Iowa State College graduates in the high and low earned income categories of any of the five occupations considered.

5. Communications grade differential

To obtain a grade differential in the academic area of communications, grades earned in the first three courses taken in English, speech, or journalism at Iowa State College were obtained. The difference between the mean of those grades and the mean of the first three grades earned in

each of the areas of agriculture, science, and social science was determined and used as the communications grade differential. The t-test and biserial correlation techniques yielded values of r_{bis} and t as shown in Table 7.

Table 7

Communications Grade Differential

Occupation	r_{bis}	t
Extension	-0.2867	2.3530[1]
Farming	0.0233	0.1840
Journalism	-0.0860	0.6814
Sales	-0.0869	0.6888
College teaching	0.1543	1.2310

[1]Significant at 5 percent level.

For graduates working in extension there was a significant difference between the high and low income groups on communications grade differential. The negative biserial correlation of -0.2867 indicates that those graduates who earned poorer grades in communications subjects than in other academic areas were more likely to be in the high income category of the extension group.

6. High school average

Numerous research studies in education have used high school grade average as a prognosis of college success. In the present study it was hoped that this measure of scholastic ability might be helpful in the study of occupational success of agriculture graduates. The high school grade averages for individuals included in this study were obtained from the Registrar's office.

The biserial correlation technique was used to determine the relationship between high school average and earned income, and the t-test was used to determine the significance of high school average difference between high and low income groups in each of the five occupations. Resulting values of t and r_{bis} are shown in Table 8.

Table 8

High School Average

Occupation	r_{bis}	t
Extension	-0.1113	0.8842
Farming	-0.1685	1.3490
Journalism	-0.0613	0.4850
Sales	-0.0664	0.5296
College teaching	0.1093	0.8680

High school average showed little relationship to earned income. Only for those graduates employed in college teaching and research was there a positive relationship between high school average and earned income, with an r_{bis} of 0.1093. No significant difference was found in high school average between high and low earned income groups in any of the occupations.

7. Scholastic aptitude

The percentile rank on the scholastic aptitude tests given to entering students at Iowa State College also was thought to be a characteristic which might be related to success as measured by earned income. Values of t were obtained to determine significance of the difference between high and low earned income groups with respect to scholastic aptitude. Biserial correlation was used to determine relationships between scholastic aptitude and earned income. Resulting values are shown in Table 9.

For all occupations, small negative values of r_{bis} were obtained between scholastic aptitude and earned income. This would indicate that if any relationship exists it is probably one in which those graduates with high scores on scholastic aptitude tests have less tendency to be in the

Table 9

Scholastic Aptitude

Occupation	r_{bis}	t
Extension	-0.0706	0.5589
Farming	-0.1351	1.0730
Journalism	-0.0982	0.7791
Sales	-0.0662	0.5239
College teaching	-0.1076	0.8545

higher earned income group. No significant difference was found between high and low earned income groups when t-test was used.

8. Extracurricular activities

Estimates of participation in extracurricular activities made by the graduates themselves were used as a measure of such participation for the purpose of this study. In the Rhea questionnaire, each graduate was asked to evaluate the extent of his participation in extracurricular activities as "below average", "average", or "above average". These responses were assigned numerical values of one, two, and three respectively, and were so used in this study.

To determine the extent to which participation in extra-curricular activites is related to the dichotomously

categorized earned income data, biserial correlations were computed. In addition, t-tests were used to determine significance of differences between the high and low earned income groups in the occupations studied. Results of these analyses are shown in Table 10.

Table 10

Extracurricular Activities

Occupation	r_{bis}	t
Extension	0.1728	1.3850
Farming	0.0362	0.2859
Journalism	0.0176	0.1389
Sales	-0.0494	0.3910
College teaching	0.0775	0.6137

Since the values assigned to responses to the item on extracurricular activites were three for "less than average", two for "average", and one for "more than average", a positive r_{bis} indicates a negative relationship between the number of extracurricular activites and earned income, and a negative r_{bis} indicates the degree of positive relationship. Hence there is a small positive relationship between the degree of participation in extracurricular

activities and earned income for the sales group, and a negative relationship in the other four groups. No significant differences in extent of extracurricular participation between the high and low earned income groups were found in any of the occupations studied.

9. Height

Another characteristic used in the analysis of earned income was the height of the graduates in the five occupations. The heights used were those recorded in the personnel office of the Iowa State College Division of Agriculture. Analyses were made using biserial correlation to determine the relationship between height and earned income in the five occupational groups. Determination of the significance of the difference in mean height of high and low earned income categories was accomplished by use of the t-test. Values of r_{bis} and t are shown in Table 11.

On the basis of these analyses, it would seem that height is not an important factor in determining the magnitude of earned income of graduates in agriculture, at least in the five occupations considered here. In sales work, where certain employers prefer to hire tall men, the mean height of the high and low earned income groups was

Table 11

Height

Occupation	r_{bis}	t
Extension	0.0163	0.1295
Farming	0.1275	1.0260
Journalism	0.0836	0.6623
Sales	0.0000	0.0000
College teaching	0.1825	1.4640

identical. Leibler[1] reported that tall men have a decided advantage over short men in numerous occupations, especially in those which require contacts with people.

Perhaps one of the reasons for the lack of relationship between height and earned income of the Iowa State College graduates studied here is that the mean height of 5'10" for these individuals is greater than that of adult men in the total population of the United States. Although other studies have indicated that height is related to success, it is possible that the effect of height has been erased by the natural selection that takes place in college enrollment and attrition-survival during college.

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[1]Leibler, Leslie. It Pays To Be Tall. Des Moines Sunday Register. This Week Magazine. 12-13. June 28, 1953.

10. Residence prior to college entrance

Residence before college matriculation was classified, for purposes of this study, on the basis of farm or non-farm. Chi square was used to determine the significance of differences between high and low earned income groups with regard to farm or non-farm residence before college. The values of chi square are shown in Table 12. The non-significant chi square values indicate that there were no measurable differences between the high and low income groups with regard to prior farm or non-farm residence.

B. Significance of Characteristics in Earned Income Groups by Occupation

Biserial correlation and analysis of variance techniques failed to demonstrate relationships between the characteristics chosen and earned income. Small differences did occur, however, between the high and low earned income groups as shown in Table 13. Differential grade average as reported in Table 13 is the difference between the mean of the first three grades in a particular area and the composite mean of the first three grades in each of the other three subject matter areas. In Table 13, as elsewhere

Table 12

Residence Prior to College Entrance by Earned Income Group

Occupation	Farm		Non-farm		Chi square
	High	Low	High	Low	
College	32	27	18	23	1.03
Farming	44	47	6	3	0.61
Extension	48	42	2	8	2.78
Journalism	33	32	17	18	0.04
Sales	19	25	31	25	1.46
Total	176	173	74	77	0.09

Table 13

Mean Values of Characteristics in Earned Income Groups

Occupation	Earned income	Grade ave.	Differential Grade Ave.				A C E ave.	Extra curric. partic.	Height (inches)
			Ag.	Sci.	Soc.Sc.	Comm.			
Journalism	High	2.51	.22	-.59	.17	.23	60	1.5	70.1
	Low	2.41	.34	-.73	.02	.33	63	1.52	69.8
College teaching	High	2.95	.45	-.17	.16	-.39	60	1.88	70.7
	Low	2.41	.34	-.24	.02	-.28	65	2.02	70.0
Sales	High	2.43	.60	-.49	.05	-.14	47	2.08	70.5
	Low	2.40	.61	-.39	.00	-.24	50	2.14	70.5
Extension	High	2.49	.62	-.35	.17	-.47	41	2.00	69.9
	Low	2.43	.64	-.47	-.01	-.16	44	2.18	70.0
Farming	High	2.47	.65	-.47	.19	-.37	42	1.98	70.1
	Low	2.51	.54	-.37	.25	-.39	48	2.02	69.6
All	High	2.57	.51	-.41	.15	-.24	50	1.89	70.3
	Low	2.49	.51	-.44	.05	-.15	54	1.98	70.0

in this study, the extent of extracurricular participation was assigned values of one for "above average", two for "average", and three for "below average", so that lower values indicate greater participation.

It may be of interest to note from Table 13 that the greatest difference in height occurred for college teachers where the higher earned income graduates were 0.7 inch taller on an average than the lower income graduates. This difference was non-significant with a t-value of 1.464, however, as reported previously in this chapter in Table 11.

Further observation of differences between high and low earned income groups indicated that multiple classification analysis of variance would provide a more sensitive test of differences, wherein variations among the occupations could be controlled. Table 14 shows the significance of characteristics in earned income groups by occupation. Here again no significant differences between high and low earned income groups could be demonstrated, although multiple classification provided for control on occupation. Non-significant F-values for interaction indicate that the evidence does not substantiate that high and low earned income groups vary with regard to any of the characteristics among the five occupations. Highly significant differences among occupations without regard to income groups were

Table 14

Significance of Characteristics in Earned Income Groups by Occupation

Characteristics	F - values		
	Among occupations (d.f.=4)	High-low income (d.f.=1)	Interaction (d.f.=4)
College grade average	19.7435[1]	3.6804	1.1204
Agriculture grade differential	7.0204[1]	0.0051	0.0593
Science grade differential	5.2251[1]	0.3113	0.4950
Social science differential	1.7224	3.3687	0.7848
Communications differential	16.3626[1]	2.1463	1.3459
High school average	8.3973[1]	0.3050	1.0928
Scholastic aptitude	13.4511[1]	2.8710	0.4288
Extracurricular activities	12.2199[1]	1.9824	0.2826
Height	1.4479	1.8626	0.4759

[1]Significant at 1 percent level.

obtained for seven of the characteristics as shown in Table 14.

In summarizing the tests of significance shown in Table 14, the usefulness of the factors here considered seems to lie in the realm of occupational choice rather than in distinguishing between the financially poorer or better rewarded graduates.

VI. CHARACTERISTICS RELATED TO LATER OCCUPATION

Although differences between the high and low earned income groups were non-significant for most characteristics within the occupations, it was shown that significant differences in the characteristics occur among the five occupational groups whenever the income level was disregarded. If the high-low earned income is disregarded, as suggested by the analysis in the foregoing section, the possibility still remains of evaluating the characteristics known from available records, for discriminating among occupational groups. Particularly, it is desirable to know whether each occupation presents a unique pattern of these characteristics.

As a preliminary step in this evaluation, an analysis of variance was computed for the characteristics singly, yielding F- values as shown in Table 15. Significant differences at the one percent level were obtained for the characteristics (1) college grade average, (2) agriculture grade differential, (3) science grade differential, (4) communications grade differential, (5) high school average, (6) scholastic aptitude, and (7) extracurricular activities. These highly significant differences among the occupations

Table 15

Values of F among Occupations

Characteristic	F
College grade average	18.805[1]
Agriculture grade differential	7.060[1]
Science grade differential	5.254[1]
Social science grade differential	1.717
Communications grade differential	15.265[1]
High school average	8.422[1]
Scholastic aptitude	13.296[1]
Extracurricular activities	12.265[1]
Height	1.452

[1]Significant at 1 percent level.

studied indicate that the groups vary with regard to several of the characteristics selected for use in this study. Evaluation of these differences among the occupational groups aided in the selection of characteristics used in the discriminant analysis for the purpose of distinguishing among occupations.

To determine whether residence prior to college entrance differed significantly among the occupational groups, chi square analysis was used. It may be noted in Table 16 that the prior residence of graduates varied greatly in the five occupational groups. A highly significant chi square value of 78.88 was obtained, which verifies the observation

Table 16

Prior Residence of Graduates by Occupation

Prior residence	Occupation					
	College	Farming	Extension	Journalism	Sales	Total
Farm	59	91	90	65	44	349
Non-farm	41	9	10	35	56	151

that differences with respect to prior farm or non-farm residence occur.

Of those graduates engaged in farming, 91 of the 100 studied lived on farms prior to college entrance. It is well known that economic considerations are influential in determining which graduates may have an opportunity to become established in farming. Another occupation in which a high proportion of graduates had farm backgrounds was that of extension, where 90 of the 100 had lived on farms prior to college entrance. Here the large proportion of farm-reared graduates was undoubtedly due to requirement of farm background for employment in many extension positions. In the occupations of sales, college teaching and research, and journalism, residence prior to college attendance appeared to have less effect on later occupational choice than when the graduate was engaged in farming or extension

work. Although prior farm or non-farm residence was shown to differ significantly among the occupations chosen, it was not believed to be a usable characteristic for forecasting similarity to occupational pattern.

Discriminant analysis provided a technique for evaluating the similarity of an individual to graduates established in the five occupations considered in this study.[1] Of the ten characteristics for which information was assembled, six were chosen for use in the discriminant equations. Selection was made on the basis of significance revealed by analysis of variance as shown in Table 15, with the exception of high school average, which was excluded despite a significant difference among the five occupations. High school average was omitted because college grade average and scholastic aptitude rank were believed to afford more recent measures of scholastic aptitude and scholastic ability.

The six characteristics selected for discriminant analysis were college grade average, agriculture grade differential, science grade differential, communications

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[1]Wert, James E., Neidt, Charles O., and Ahmann, J. Stanley. Statistical Methods in Educational and Psychological Research. Appleton-Century-Crofts. New York, New York. In Press.

grade differential, scholastic aptitude, and extracurricular activities. These characteristics were designated as variables X_1, X_2, X_3, X_4, X_5, and X_6, respectively.

The equation for the discrimination of sales and farming yields a technique for evaluating the degree to which a person is similar to those engaged in sales rather than farming. To score for farming, all signs in the right-hand member of the equation are changed. The equation for sales and farming was

$$V = -0.27088X_1 + 0.01966X_2 + 0.02250X_3 + 0.02962X_4 + 0.00240X_5 + 0.07968X_6 - 1.35040$$

where V is the $\frac{x}{\sigma}$ score for similarity to graduates in sales rather than farming, and the X-designations are values of the variable characteristics. A minus V-score for any given individual indicates that his characteristics are more like those of farmers, whereas a positive V-score indicates similarity to persons engaged in sales work. The multiple biserial correlation between the composite of characteristics and tendency to become established in sales or farming yielded R_{bis} of 0.2915 which was found to be non-significant with an F-value of 1.882.

A similar equation for discrimination of sales and journalism provided for evaluation of the degree to which a

person is similar to those in sales rather than journalism. For scoring for journalism, all signs in the right-hand member of the equation are changed. The equation for sales and journalism was

$$V = - 0.01149X_1 + 0.03387X_2 + 0.02065X_3 - 0.00740X_4 - 0.00456X_5 + 0.32093X_6 - 1.61938$$

yielding a multiple biserial correlation of 0.6186 between the composite characteristics and tendency to become established in sales or journalism which was significantly different from zero at the one percent level, with an F-value of 12.08.

The equation for discrimination of sales and extension provided for evaluation of the degree to which an individual is similar to those graduates in sales rather than extension. For scoring for extension, all signs in the right-hand member of the equation are changed. The discriminant equation for sales and extension was

$$V = - 0.20383X_1 + 0.00964X_2 + 0.00831X_3 + 0.01323X_4 + 0.00387X_5 - 0.01635X_6 - 0.40963 .$$

The R_{bis} value of 0.2111 showed a non-significant relationship between the composite of characteristics and tendency to become established in sales or extension, with an F-value of 0.95.

The equation for discrimination of sales and college teaching yielded a technique for evaluation of the degree to which an individual is similar to those in sales rather than in college teaching and research. All signs in the right-hand member of the equation are changed. The discriminant equation for sales and college teaching and research was

$$V = - 0.68856X_1 + 0.02437X_2 + 0.00907X_3 + 0.01330X_4 - 0.00283X_5 + 0.08271X_6 + 0.57848 .$$

The R_{bis} of 0.5888 showed a highly significant relationship between the composite of characteristics and tendency to become established in sales or college teaching and research, with an F-value of 10.35.

The equation for discrimination of extension and farming provided a technique for evaluating the degree to which an individual is similar to graduates engaged in extension rather than farming. For scoring for farming, all signs in the right-hand member of the equation are changed. The discriminant equation for extension and farming was

$$V = - 0.08475X_1 - 0.00045X_2 + 0.00855X_3 + 0.01108X_4 - 0.00116X_5 + 0.05588X_6 - 0.26479 .$$

The R_{bis} of 0.1289 showed a non-significant relationship between the composite of characteristics and tendency to become engaged in extension or farming, with an F-value of 0.340.

The equation for discrimination of extension and journalism provided a technique for evaluating the degree to which an individual is similar to graduates engaged in extension rather than journalism. For scoring for journalism, all signs in the right-hand member of the equation are changed. The discriminant equation for extension and journalism was

$$V = 0.06079X_1 + 0.02536X_2 + 0.01409X_3 - 0.02218X_4 - 0.00761X_5 + 0.03033X_6 - 0.28064 .$$

The R_{bis} of 0.5921 with an F-value of 10.54 indicated a highly significant relationship between the composite of characteristics and tendency to enter extension or journalism.

The equation for discrimination of extension and college teaching provided a technique for evaluating the degree to which an individual is similar to graduates engaged in extension rather than college teaching and research. For scoring for college teaching and research, all signs in the right-hand member of the equation are changed.

The discriminant equation for extension and college teaching was

$$V = - 0.59311X_1 - 0.02215X_2 - 0.00122X_3 - 0.00483X_4 - 0.00506X_5 + 0.17736X_6 + 2.27575 .$$

The R_{bis} of 0.5401 with an F-value of 8.12 indicated a highly significant relationship between the composite of characteristics and tendency to enter extension or college teaching.

The equation for discrimination of journalism and farming provided a technique for evaluating the degree to which an individual is similar to college graduates engaged in journalism rather than farming. For scoring for farming, all signs in the right-hand member of the equation are changed. The equation was

$$V = - 0.24599X_1 - 0.02106X_2 - 0.00189X_3 + 0.03181X_4 + 0.00598X_5 - 0.29120X_6 + 0.67221 .$$

The R_{bis} of 0.6613 with an F-value of 14.99 showed a highly significant relationship between the composite of characteristics and tendency to enter journalism or farming.

The equation for discrimination of journalism and college teaching provided a technique for evaluating the degree to which an individual is similar to college graduates engaged in journalism rather than college teaching

and research. For scoring for college teaching and research, all signs in the right-hand member of the equation are changed. The equation was

$$V = -0.50305X_1 - 0.00915X_2 - 0.00584X_3 + 0.02662X_4 + 0.00015X_5 - 0.24031X_6 + 1.46941 .$$

The R_{bis} of 0.7166 with an F-value of 20.12 indicated a highly significant relationship between the composite of characteristics and tendency to enter journalism or college teaching.

The equation for discrimination of college teaching and farming provided a technique for evaluating the degree to which an individual is similar to college graduates engaged in college teaching and research rather than farming. For scoring for farming, all signs in the right-hand member of the equation are changed. The equation for college teaching and farming was

$$V = 0.48415X_1 - 0.00620X_2 + 0.01026X_3 + 0.00900X_4 + 0.00522X_5 - 0.02248X_6 - 1.76717 .$$

The R_{tis} of 0.5199 with an F-value of 7.34 indicated a highly significant relationship between the composite of characteristics and tendency to enter college teaching or farming.

The foregoing discriminant equations yielded multiple biserial correlations which showed the relationship between the six characteristics and tendency for graduates to be in one occupation rather than another. The correlation coefficients are shown in Table 17. Magnitude of the correlations indicates that the characteristics chosen provide a reasonable basis for discriminating such occupations as college teaching and journalism from any of the other three occupations, as well as from each other. The same characteristics are of less value, however, for discriminating the occupations of sales, farming, and extension.

A further interpretation of the biserial correlations may be that a distinct pattern of the six characteristics used for discriminant analysis is established for graduates engaged in the occupations of journalism and college teaching.

Apparently, from the information regarding graduates here studied, no distinct pattern of the six characteristics is distinguishable for the occupations of extension, farming, and sales.

The characteristics used in this study appear to have a relationship to occupational choice. It is possible, however, that further information could be assembled as

Table 17

Six Variable Biserial Correlations of Occupational Tendency[1]

Occupation	College teaching	Sales	Extension	Journalism	Farming
College teaching	--	0.5888	0.5401	0.7166	0.5199
Sales	0.5888	--	0.2111	0.6186	0.2915
Extension	0.5401	0.2111	--	0.5921	0.1289
Journalism	0.7166	0.6186	0.5921	--	0.6613
Farming	0.5199	0.2915	0.1289	0.6613	--

[1]Significance level: 5 percent = 0.309
1 percent = 0.354

college routine, regarding the interest and personality characteristics of students. Such information should be of value to counselors in helping students make their choice of occupation. Undoubtedly, some such information is now used in a subjective way when a counselor appraises a student and, guided by knowledge of the requirements of particular occupations, helps the student decide his occupational fate. By tempering the judgment of the counselor with more objective measures of interest and personality which could be incorporated in discriminant equations, it would seem that greater service could be rendered to the student and to his future employer.

VII. FORECASTING SIMILARITY OF CHARACTERISTICS OF AN INDIVIDUAL TO AN OCCUPATIONAL PATTERN

The discriminant equations in the foregoing chapter provide a technique for determining the similarity of characteristics of an individual and the pattern of those characteristics for one occupation rather than another. The characteristics used as variables in those equations were (1) college grade average, (2) agriculture grade differential, (3) science grade differential, (4) communications grade differential, (5) scholastic aptitude, and (6) extracurricular participation. The equations should be helpful in counseling college students of agriculture regarding choice of an occupation. For example, an agriculture student may come to his counselor with the problem of deciding whether he is best suited for work in journalism or in sales. The discriminant equation for those two occupations could be used to provide an estimate of similarity of the characteristics of that student with the pattern of those same characteristics possessed by Iowa State College graduates already employed in the occupations.

Solution of the discriminant equation to provide information which would assist in the vocational guidance of an individual student would be somewhat laborious. If the student needed advisement concerning his similarity to occupational patterns of more than two vocations, solution of several equations might be required. Considering the large number of counselees assigned to each counselor, time probably would not permit use of a technique which required solution of equations. Therefore, it was believed that a forecasting scheme which would more readily yield scores for an individual for each of the five occupations would be desirable.

To provide a more convenient method for evaluation of similarity of characteristics to occupational pattern, equations were set up which would discriminate between one occupation and the other four. Use of five such equations provided a means for obtaining scores which could be used in construction of tables, which in turn could be used for scoring individuals.

The equation for any one occupational pattern was obtained by averaging the coefficients which were found for that pattern as contrasted to each of the other four occupational groups studied. The equation thus found, when put into raw score form, yielded an average prediction of zero

with a standard deviation of one. In order to eliminate decimals and negative numbers, this formula was changed to yield standard scores with a mean of 1000.

A series of scoring tables were prepared as shown in Tables 18, 19, 20, 21, 22, and 23, whereby a counselor readily could obtain a score for similarity to any of the five occupational groups. It should be pointed out that these tables are mathematically equivalent to the average discriminant equations, the fractions and negative numbers only having been eliminated. Each table yields scores for one characteristic. It is necessary to sum the scores for each occupation and apply the constant for that occupation to score an individual for similarity.

For example, if John Doe has a college grade average of 2.3, an agriculture differential of 0.2, a science differential of -0.6, a communications differential of 0.6, a scholastic aptitude percentile rank of 65, and was above average in extracurricular participation, his scoring would be done as follows. From Tables 18, 19, 20, 21, 22, and 23, similarity scores for John Doe for each of the five occupations would be as shown in Table 24.

To evaluate the workability of the scoring scheme, the 500 graduates included in this study were scored for similarity to occupational pattern. A better evaluation

Table 18

Similarity Scores for College Grade Average

College grade ave.	College teaching	Farming	Extension	Journalism	Sales
4.0	1248	65	0	0	0
3.9	1191	62	10	20	29
3.8	1135	59	21	40	59
3.7	1078	56	31	60	88
3.6	1021	53	41	80	118
3.5	964	50	52	100	147
3.4	908	47	62	120	176
3.3	851	44	72	140	206
3.2	794	41	83	160	235
3.1	737	38	93	180	264
3.0	681	35	103	200	294
2.9	620	32	114	220	323
2.8	567	29	124	240	353
2.7	511	26	134	259	382
2.6	454	24	145	279	411
2.5	397	21	155	299	441
2.4	340	18	165	319	470
2.3	284	15	176	339	499
2.2	227	12	186	359	529
2.1	170	9	196	379	558
2.0	113	6	207	399	587
1.9	57	3	217	419	617
1.8	0	0	227	439	646

Table 19

Similarity Scores for Agriculture Grade Differential

Agriculture grade differential	College teaching	Farming	Extension	Journalism	Sales
2.0	7	72	0	0	788
1.8	6	69	3	40	749
1.6	6	65	6	81	709
1.4	6	62	9	121	670
1.2	5	58	12	161	630
1.0	5	54	16	201	591
0.8	5	51	19	242	552
0.6	4	47	22	282	512
0.4	4	43	25	322	473
0.2	4	40	28	362	433
0.0	3	36	31	403	394
-0.2	3	33	34	443	355
-0.4	3	29	38	483	315
-0.6	2	25	40	523	276
-0.8	2	22	43	563	236
-1.0	2	18	47	604	197
-1.2	1	15	50	644	158
-1.4	1	11	53	684	118
-1.6	1	7	56	724	79
-1.8	0	4	59	765	39
-2.0	0	0	62	805	0

Table 20

Similarity Scores for Science Grade Differential

Science grade differential	College teaching	Farming	Extension	Journalism	Sales
2.0	74	0	118	0	545
1.8	71	18	112	19	518
1.6	67	36	106	38	490
1.4	63	53	100	57	463
1.2	59	71	94	76	436
1.0	56	89	89	96	409
0.8	52	106	83	115	381
0.6	48	124	77	134	354
0.4	45	142	71	153	327
0.2	41	160	65	172	300
0.0	37	177	59	191	272
-0.2	33	195	53	210	245
-0.4	30	213	47	229	218
-0.6	26	231	41	248	191
-0.8	22	248	35	268	164
-1.0	19	266	30	287	136
-1.2	15	284	24	306	109
-1.4	11	302	18	325	82
-1.6	8	319	12	344	55
-1.8	4	337	6	363	27
-2.0	0	355	0	382	0

Table 21

Similarity Scores for Communications Grade Differential

Communications grade differential	College teaching	Farming	Extension	Journalism	Sales
2.0	0	0	0	792	439
1.8	12	37	13	753	417
1.6	24	73	26	713	395
1.4	35	110	39	673	373
1.2	47	147	53	634	351
1.0	59	183	66	594	329
0.8	71	220	79	555	307
0.6	82	257	92	515	285
0.4	94	294	105	475	263
0.2	106	332	118	436	241
0.0	118	367	131	396	220
-0.2	129	404	144	356	198
-0.4	141	440	158	317	176
-0.6	153	477	171	277	154
-0.8	164	514	184	238	129
-1.0	176	550	197	198	110
-1.2	188	587	210	158	88
-1.4	200	624	223	119	66
-1.6	211	660	236	79	44
-1.8	223	697	249	40	22
-2.0	235	734	263	0	0

Table 22

Similarity Scores for Scholastic Aptitude

Scholastic aptitude percentile	College teaching	Farming	Extension	Journalism	Sales
95	292	0	0	412	0
90	276	16	22	389	1
85	260	31	44	366	3
80	243	47	66	343	4
75	227	62	89	320	6
70	211	78	111	289	7
65	195	93	133	275	8
60	178	109	155	252	10
55	162	124	177	229	11
50	146	140	199	206	12
45	130	156	222	183	14
40	114	171	244	160	15
35	97	187	266	137	17
30	81	202	288	114	18
25	65	218	310	92	19
20	49	233	332	69	21
15	32	249	355	46	22
10	16	264	377	23	24
5	0	280	389	0	25

Table 23

Similarity Scores for Extracurricular Participation and Additive Constant

Degree of participation	College teaching	Farming	Extension	Journalism	Sales
Above average	21	0	0	441	0
Average	11	45	70	221	117
Below average	0	89	140	0	234
Constant	16	78	309	-941	-516

Table 24

Example of Work Sheet for Scoring an Individual

Characteristic		Needed entries from Table no.	Scoring for similarity				
Name	Value		College	Farming	Extension	Journalism	Sales
College grade average	2.3	18	284	15	176	339	499
Agriculture differential	0.2	19	4	40	28	362	433
Science differential	-0.6	20	26	231	41	248	191
Communications differential	0.6	21	82	275	92	515	285
Scholastic aptitude	65	22	195	93	133	275	8
Extracurricular participation	Above average	23	21	0	0	441	0
Constant		23	16	78	309	-941	-516
Total			628	714	779	1239	900

might be produced by applying the scoring scheme to a different group of graduates than those used in producing the scheme. It was believed, however, since information concerning another group of graduates employed in these occupations was not available, that application of the scheme to the 500 graduates for whom information was available would serve to give an indication of its workability. The usefulness of the scoring scheme for discrimination is to some extent over-estimated when applied to the group with whom the scoring key has been developed. It may be noted from Table 25 that about half the graduates employed in the fields of journalism and college teaching and research scored highest for the occupation in which they were employed. No definite pattern was exhibited by graduates in the fields of extension, sales, and farming. For those graduates employed in extension, for example, greater numbers received their highest score in sales rather than in their own field of employment. Apparently characteristics other than those used in this study influence establishment in those occupations of sales, farming and extension. Although no evidence has been reported in tabular form, it should be mentioned that approximately ten percent of the graduates scored lower than average in each of the five occupations, which indicates that some graduates do not

Table 25

Highest Similarity Scores for 500 Graduates

Predicted highests for	Present occupation				
	College	Farming	Extension	Journalism	Sales
College teaching	50	15	12	12	11
Farming	13	27	27	9	16
Extension	10	19	21	4	17
Journalism	9	10	6	49	17
Sales	18	29	34	26	39

possess characteristics similar to any of the five occupational patterns here established.

As mentioned previously, it is possible that additional information concerning interests and personality traits of agriculture students could be assembled as a part of college routine. Such information, if incorporated in discriminant equations with characteristics here studied, might serve to forecast better the similarity of graduates to occupational patterns.

VIII. SUMMARY

The purpose of this study was twofold. Graduates of the Iowa State College Division of Agriculture were studied (1) to determine characteristics related to success in later occupation as measured by earned income, and (2) to determine characteristics related to occupational choice of agricultural college graduates.

The study was limited to 500 graduates of the Iowa State College Division of Agriculture during the period 1932 to 1952, inclusive. One hundred graduates in each of the occupational areas of sales, journalism, extension, farming, and college teaching and research were included. Names of graduates and such information as their occupations, earned income, and certain other characteristics were obtained from questionnaires returned in 1952 by these same graduates for another study. Additional information concerning the graduates was obtained from college records. From these sources, information was secured regarding characteristics believed to bear some relationship to either occupational success or occupational choice. The characteristics were (1) college grade average, (2) agriculture grade differential, (3) science grade differential, (4) social

science grade differential, (5) communications grade differential, (6) high school average, (7) scholastic aptitude, (8) extracurricular activities, (9) height, and (10) farm or non-farm residence before college matriculation. Grade differential was the designation given to the difference between the average grade in one subject matter area and the average in three other areas.

The use of earned income as a criterion of occupational success was based on availability of that information and the lack of other criteria of success. A quadratic equation of the form $Y = -aX^2 + 60aX + C$ was obtained by the method of least squares and solved for earned income and number of years since graduation for each occupation. Solution of the equation provided an adjusted median income for from one to twenty-one years after graduation which was used to separate graduates within the occupations into "above average" and "below average" earned income groups. Although it was not an express purpose of this study to compare earned income of the various occupations, it was noted that solution of the quadratic equations yielded widely varying earned income values for graduates in the five occupations. Predicted maximum earned incomes 30 years after graduation varied from 5,577 dollars for graduates in extension to 9,374 dollars for graduates in journalism.

In the analysis of characteristics related to earned income, the technique of biserial correlation was used to determine the relationship of each of the characteristics chosen to high-low earned income. The t-test was used to test for significance of the difference between high and low earned income groups in each occupation for each of the characteristics. The only characteristics which were revealed to have a significant relationship to earned income were college grade average and communications grade differential. For graduates engaged in college teaching and research, those with higher college grade average had a tendency to be in the higher earned income group with an r_{bis} of 0.2433 and a t-value of 1.974 which was significant at the five percent level. A negative correlation of -0.2867 and a t-value of 2.3530 was found between communications grade differential and earned income for graduates engaged in extension work. The negative correlation indicated that those graduates who did less well in communications subjects have a tendency to make higher earned incomes than the graduates who do better in communications than in other subjects. None of the other characteristics was significantly different between high and low earned income groups in the five occupations considered.

Chi square was used to determine the significance of differences between high and low earned income groups with regard to farm or non-farm residence prior to college matriculation. All chi square values were non-significant, indicating that no differences could be shown between high and low earned income groups with regard to farm or non-farm residence prior to college.

Multiple classification analysis of variance was used as a more sensitive test of significance, whereby variations among the occupations could be controlled. No significant differences between high and low income groups could be demonstrated when occupational classification was controlled. Highly significant differences among occupations without regard to earned income groups were obtained for the characteristics (1) college grade average, (2) agriculture grade differential, (3) science grade differential, (4) communications grade differential, (5) high school average, (6) scholastic aptitude, and (7) extracurricular activities. Hence, the usefulness of the characteristics appeared to lie in the realm of occupational choice rather than in distinguishing between higher income and lower income graduates.

Discriminant analysis provided a technique for evaluating the similarity of an individual to graduates

established in the five occupations considered in this study. Six characteristics for use in the discriminant equations were selected on the basis of significance of F-values for analysis of variance. The characteristics were (1) college grade average, (2) agriculture grade differential, (3) science grade differential, (4) communications grade differential, (5) scholastic aptitude, and (6) extra-curricular activities.

The discriminant equations were used to compute multiple biserial correlations which showed the relationship between the six characteristics and tendency for graduates to be in one occupation rather than another. Magnitude of the correlations, varying from 0.1289 to 0.7166, indicated that the characteristics chosen provide a reasonable basis for discriminating such occupations as college teaching and journalism from any of the other occupations studied. The same characteristics were found to be of less value, however, for discriminating the occupations of sales, farming, and extension.

To provide a scoring key by which similarity of characteristics of an individual to occupational pattern could be obtained, equations were solved to discriminate each occupation from the other four studied. The equation for any one occupational pattern was obtained by averaging

the coefficients which were found for that pattern as contrasted to each of the other four. A series of tables were prepared from which a counselor could obtain scores for an individual, evaluating similarity to graduates already established in occupations. To obtain evidence concerning the usefulness of the scoring system, each of the 500 graduates included in the study were scored for similarity to occupational pattern. It was recognized that the degree of usefulness revealed by scoring the individuals with whom the system was devised would be an over-estimate of the value of the scoring system.

Similarity scores for the 500 graduates gave further indication that the equations discriminate the occupations of journalism and college teaching from sales, extension, and farming, as well as from each other. The system did not appear to be satisfactory, however, for discriminating sales, extension, and farming.

It was suggested that information concerning interests and personality traits of students could be assembled as college routine. That information, incorporated in discriminant equations with the characteristics used in this study might provide a more accurate method of determining similarity of agricultural college graduates to occupational pattern.

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